THE ROLE OF THE DEPARTMENT OF DEFENSE IN THE RESEARCH AND DEVELOPMENT OF ALTERNATIVE FUELS

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MITCHELL L. HOINES, LIEUTENANT COLONEL, U.S. MARINE CORPS
B.S., Biology, South Dakota State University, Brookings, South Dakota, 1989

Fort Leavenworth, Kansas
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This paper examined the implications of the U.S. national energy strategies and policies that directly or indirectly require the Department of Defense (DOD) to develop initiatives to conduct costly research and development (R&D) of alternative fuels. The main research question is: What are the current policies that direct the military to conduct research and development of biofuels? The DOD lacks an efficient, effective program for development of alternative fuels due to: (1) the U.S. political process; (2) intergovernmental bureaucracy; and (3) DOD budgeting process.

This study highlights how the political process inhibits an effective DOD alternative energy program. It shows that the individual service's initiatives must be nested with the DOD's programs and U.S. national strategy. This thesis recommends that the nation's energy security strategy should provide clear guidance to the Secretary of Defense (SECDEF), and that the SECDEF should then provide specific guidance as to the role each service plays in alternative fuels R&D and provide allocated budget guidance to each of the services.

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Name of Candidate: LtCol Mitchell L. Hoines

Thesis Title: The Role of the Department of Defense in the Research and Development of Alternative Fuels

Approved by:

_____, Thesis Committee Chair
Timothy R. Hentschel, Ph.D.

_____, Member
Stephen E. Brown, M.S.

_____, Member
Daniel C. Hodges, M.M.A.S.

Accepted this 12th day of June 2015 by:

_____, Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

THE ROLE OF THE DEPARTMENT OF DEFENSE IN THE RESEARCH AND DEVELOPMENT OF ALTERNATIVE FUELS, by LtCol Mitchell L. Hoines, 75 pages.

This paper examined the implications of the U.S. national energy strategies and policies that directly or indirectly require the Department of Defense (DOD) to develop initiatives to conduct costly research and development (R&D) of alternative fuels. The main research question is: What are the current policies that direct the military to conduct research and development of biofuels? The DOD lacks an efficient, effective program for development of alternative fuels due to: (1) the U.S. political process; (2) inter governmental bureaucracy; and (3) DOD budgeting process.

This study highlights how the political process inhibits an effective DOD alternative energy program. It shows that the individual service's initiatives must be nested with the DOD's programs and U.S. national strategy. This thesis recommends that the nation's energy security strategy should provide clear guidance to the Secretary of Defense (SECDEF), and that the SECDEF should then provide specific guidance as to the role each service plays in alternative fuels R&D and provide allocated budget guidance to each of the services.

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ACRONYMS

ASD(OEPP)	Assistant Secretary of Defense for Operational Energy Plans and Programs
DARPA	Defense Advanced Research Projects Agency
DOD	Department of Defense
DOE	Department of Energy
DOS	Department of State
DPA	Defense Production Act of 1950
FY	Fiscal Year
MOU	Memorandum of Understanding
NDAA	National Defense Authorization Act
NSS	National Security Strategy
QDR	Quadrennial Defense Review
R&D	Research and Development
SECDEF	Secretary of Defense
SECNAV	Secretary of the Navy

CHAPTER 1

INTRODUCTION AND OVERVIEW

The old cliché that necessity is the mother of invention connotes a simplistic idea for research and development (R&D). In a world that is fueled by relatively inexpensive petroleum based products that are widely available, highly refined for efficiency, performance, and low emissions, that power technologically advanced engines, it would seem that there is no necessity to invent another form of energy. Our world is complicated. Instability of many oil producing countries, competition for resources, oil cartels, war and conflict, as well as natural disasters, all directly affect oil prices. Therefore, oil price volatility and availability are strategic concerns for our federal government. For more than one hundred years, energy security has been part of our national strategy. Each time our security is threatened, policies are developed that tasks agencies of the federal government and the Department of Defense (DOD) in an attempt to mitigate the threats, and protect and conserve our natural resources.

As early as the Pickett Act of 1910, which set aside oil-bearing lands for the U.S. Navy to use as an emergency reserve; our nation has seen the need to have an energy policy.[1] During World War II, Congress started a program to produce alternative fuel from coal under the U.S. Synthetic Fuels Act of 1944, which was a direct result of the concern for oil resources and availability in our national defense strategy. This act shifted responsibility from the military and granted the Secretary of the Interior the authority to

[1] Anthony Andrews, Kelsi Bracmort, Jared T. Brown, and Daniel H. Else, Congressional Research Service Report for Congress R42568, *The Navy Biofuel Initiative Under the Defense Production Act* (Washington, DC: Library of Congress, June 22, 2012), 4.

build and operate plants, which would produce synthetic fuels for the war effort from oil shale, coal, and various forest/agricultural products.[2] Following the war, the Defense Production Act of 1950 was also a measure that was created to ensure that the military and our nation's energy strategy had priority over civilian production and consumption of petroleum based products.[3]

The Organization of Petroleum Exporting Countries oil embargo of the early 1970s proved to us that the country was strategically hobbled by it's dependence on foreign oil.[4] Long lines formed at gas stations around the country. Prices soared overnight. All Americans felt the pinch of the oil shortage. The energy crisis of the 1970s reinvigorated policy makers to pursue policies that would dampen the impact of world oil market fluctuations on the economy. National security was at stake. The risk to national security remains.

Outside stakeholders can adversely challenge our political, economic, and social systems. This nation depends on oil. Petroleum prices directly impact (either negatively or positively) almost every type of industry. For example, all phases of the farming, ranching, and agricultural industries are tied to the use of petroleum products. From planting to harvest, from shipping products to market, to processing and distribution, each phase is dependent upon the availability of petroleum. For decades, the federal

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[2] Andrews et al., 4.

[3] James T. Bartis and Lawrence Van Bibber, *Alternative Fuels for Military Applications* (Santa Monica, CA: RAND, National Defense Research Institute, 2011), xv.

[4] Office of Fossil Energy, "Our History," Department of Energy, accessed 21 January 2015, http://energy.gov/fe/about-us/our-history.

government has strived to enact various policies and strategies to alleviate the nation's dependence on Middle Eastern oil.

What has been the reaction to fluctuations in oil prices and availability? Oil producers strive to open more opportunities for exploration. Hydraulic fracturing (also known as "Fracking")[5] and other technologies have enabled oil companies to access oil and gas supplies that could not be tapped using conventional methods. Producers also pressure lawmakers for access to pristine lands and waters. The Environmental Protection Agency and the administration struggle to balance the short-term solutions with long-term consequences. Industry strives to develop technologies that will decrease the nation's need for fossil fuel. The market demand for fuel-efficient cars sharply increased within the auto industry. Hybrid gas/electric cars are being developed. Engines capable of burning E-85 utilizing fuel blended at a mixture of 85 percent ethanol and 15 percent gasoline are common on today's car lots. Other developments have vehicles modified with fuel tanks and associated parts that will allow the use of compressed natural gas or propane as a fuel source. Research for domestic alternative fuel sources and development of production methods has become a major part of the nation's energy strategy.

Following the terrorist attacks of 9/11, the nation's security situation led to numerous new policies that attempt to address the U.S. dependence on Middle Eastern oil. The Energy and Security Act of 2007 was passed with a goal of increasing the nation's energy independence.[6] This was followed by the Duncan Hunter National

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[5] Energy From Shale, "What is Fracking," accessed 28 October 2014, http://www.energyfromshale.org/hydraulic-fracturing/what-is-fracking.

[6] U.S. Congress, House, *Energy Independence and Security Act of 2007*, 110th Cong., 1st sess. (Washington, DC: U.S. Government Printing Office, January 2007),

Defense Authorization Act (NDAA) for Fiscal Year 2009, which directed the Secretary of Defense (SECDEF) to conduct a R&D study of fuel costs and required DOD to factor life-cycle cost analysis of new equipment and technologies into the acquisition process. This requirement has been a direct factor in program and technology design specifications and parameters.[7] This was followed by the White House's release of *The Blue Print for A Secure Energy Future: Progress Report*, which discusses how the nation must develop next generation fuel technologies.[8]

The 2014 *Quadrennial Defense Review* (QDR) outlines the federal government's strategy and the challenges the nation faces in an austere financial environment. It spells out the concerns for the future force and how the DOD will negotiate budget minefields that it faces. The QDR states: "The Bipartisan Budget Act of 2013 provided modest immediate relief from sequestration, but unless Congress acts, annual sequestration cuts are set to resume in FY2016."[9] This guidance influenced the individual service chiefs to issue their own service's energy initiatives and strategies.

The DOD lacks an efficient, effective program for development of alternative fuels due to: (1) the U.S. political process; (2) intergovernmental bureaucracy; and (3) the

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accessed 4 November 2014, http://www.gpo.gov/fdsys/pkg/BILLS-110hr6enr/pdf/BILLS-110hr6enr.pdf.

[7] Assistant Secretary of Defense for Operational Energy, Plans and Programs, *Energy for the Warfighter: Operational Energy Strategy* (Washington, DC: Department of Defense, 2011), 8.

[8] Heather Zichal, Steven Chu, Ray LaHood, Ken Salazar, Lisa Jackson, Tom Vilsack, and Shaun Donovan, *The Blue Print for a Secure Energy Future: Progress Report* (Washington, DC: White House, 2012), 8.

[9] Secretary of Defense, *Quadrennial Defense Review 2014* (Washington, DC: Department of Defense, 2014), iv.

DOD budgeting process. This paper examines the implications of our national energy strategies and policies that directly or indirectly require the DOD to develop initiatives to: conduct costly R&D of biofuels; attempt to develop biofuel infrastructure; and stimulate market development of biofuel production and sales in an environment wrought with bureaucracy. The Army, Air Force, Navy, and Marine Corps have developed service specific energy initiatives, which include R&D of biofuels and alternative fuel technology, while operating under limited and competitive budgets.

Ideally, this study helped show that the nation's and the DOD's energy priorities require intelligent review and oversight. There is a lack of collaboration between the DOD and other federal agencies for the advancement of biofuel research. This study helps show that the DOD's energy priorities must be nested with the U.S. national strategy. The nation's strategy on energy security should provide clear guidance to the SECDEF, and that the SECDEF should then provide specific guidance to each of the services. This will enable the DOD to provide unity of effort among the services in a fiscally constrained environment.

Proposed Research Question

What role does the DOD play in the development of alternative fuels? The DOD lacks an efficient, effective program for development of alternative fuels due to: (1) the U.S. political process' (2) intergovernmental bureaucracy; and (3) DOD budgeting process.

Secondary Research Questions

1. What are the policies and laws that underpin our alternative energy strategy?

2. What are the current policies directing military R&D of alternative fuels?

3. Is the DOD strategy nested with the national strategy?

Definitions

Biodiesel: Biodiesel is America's first advanced biofuel. It is a renewable, clean-burning diesel replacement that is reducing U.S. dependence on imported diesel, creating green jobs, and improving our environment. It is made from an increasingly diverse mix of resources including agricultural oils, recycled cooking oil, and animal fats and meets the strict specifications of American Society for Testing and Materials D6751.[10]

Biofuel: Biofuel is produced from renewable resources, especially plant biomass, vegetable oils, and treated municipal and industrial wastes. Biofuels are considered neutral with respect to the emission of carbon dioxide because the carbon dioxide given off by burning them is balanced by the carbon dioxide absorbed by the plants that are grown to produce them. The use of biofuels as an additive to petroleum-based fuels can also result in cleaner burning with less emission of carbon monoxide and particulates.[11]

Biomass: Biomass is biological material derived from living, or recently living organisms. In the context of biomass for energy this is often used to mean plant based material, but biomass can equally apply to both animal and vegetable derived material.[12]

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[10] Biodiesel, "What is Biodiesel?" National Biodiesel Board, accessed 28 March 2015, http://www.biodiesel.org/.

[11] Dictionary.com, "Biofuel," *The American Heritage® Science Dictionary*, accessed 27 July 2015, http://dictionary.reference.com/browse/biofuel.

[12] Biomass Energy Centre, "What is Biomass?" accessed 28 March 2015, www.biomassenergycentre.org.uk/portal/page?_pageid=76,15049.

Energy Security: Congress' definition of energy security in Title 10 of U.S. Code as "having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet mission essential requirements."[13]

Fracking: Fracking, or hydraulic fracturing, is the process of extracting natural gas from shale rock layers deep within the earth. Fracking makes it possible to produce natural gas extraction in shale plays that were once unreachable with conventional technologies. Recent advancements in drilling technology have led to new man-made hydraulic fractures in shale plays that were once not available for exploration. In fact, three-dimensional imaging helps scientists determine the precise locations for drilling.[14]

Mission Command: The conduct of military operations through decentralized execution based upon mission-type orders.[15]

National Defense Strategy (*NDS*): The *National Defense Strategy*, signed by the SECDEF, outlines DOD's approach to implementing the president's NSS. The NDS supports the NSS by establishing a set of overarching defense objectives that guide DOD's security activities and provide direction for the *National Military Strategy*. The NDS objectives serve as links between military activities and those of other U.S.

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[13] Legal Information Institute, "10 USC § 2924–Definitions," Cornell University Law School, 31 December 2011, accessed 19 January 2015, http://www.law.cornell.edu/uscode/text/10/2924?quicktabs_8=1#quicktabs-8. Contains definitions of "energy security," "operational energy," and "renewable energy sources," among others, as specified in the National Defense Authorization Act of 2012.

[14] Energy From Shale, "What is Fracking?"

[15] Joint Chiefs of Staff, Joint Publication 3-31, *Command and Control for Joint Land Operations* (Washington, DC: Government Printing Office, February 2014), GL-7, accessed 7 May 2015, http://www.dtic.mil/doctrine/new_pubs/jp3_31.pdf.

government departments and agencies in pursuit of national goals. This document provides the ways in the ends, ways, and means construct.[16]

National Military Strategy: The *National Military Strategy*, signed by Chairman of the Joint Chiefs of Staff, supports the aims of the NSS and implements the NDS. It describes the armed forces' plan to achieve military objectives in the near-term and provides a vision for maintaining a force capable of meeting future challenges. It also provides focus for military activities by defining a set of interrelated military objectives and joint operating concepts from which the combatant commanders and service chiefs identify desired capabilities and against which the Chairman of the Joint Chiefs of Staff assesses risk. This provides the final piece of the ends, ways, and means construct—the means.[17]

National Security Strategy (NSS): The NSS, signed by the president, addresses the tasks that, as a nation, are necessary to provide enduring security for the American people and shape the global environment. It provides a broad strategic context for employing military capabilities in concert with other instruments of national power. In the ends, ways, and means construct, the NSS provides the ends.[18]

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[16] Joint Chiefs of Staff, Joint Publication 1, *Doctrine for the Armed Forces of the United States* (Washington, DC: Government Printing Office, March 2013), 2b, accessed 28 March 2015, https://jdeis.js.mil/jdeis/index.jsp?pindex=27&pubId=540.

[17] Ibid.

[18] Ibid.

Unified Action: The synchronization, coordination, and/or integration of the activities of governmental and nongovernmental entities with military operations to achieve unity of effort.[19]

Unity of Effort: Coordination and cooperation toward common objectives, even if the participants are not necessarily part of the same command or organization, which is the product of successful unified action.[20]

Whole-of-Government Approach: A whole-of-government approach integrates the collaborative efforts of the departments and agencies of the U.S. government to achieve unity of effort. Under unified action, a whole-of-government approach identifies combinations of the full range of available U.S. government capabilities and resources that reinforce progress and create synergies.[21]

Scope and Limitations

This study shows the numerous policies that our lawmakers have crafted and details the DOD's role in biofuel R&D. It will also examine how political platforms and intergovernmental bureaucracy between the various departments and agencies impact the DOD.

[19] Ibid., GL-12, figure II-2a.

[20] Ibid., GL-13.

[21] Joint Chiefs of Staff, Joint Publication 3-08, *Interorganizational Coordination During Joint Operations* (Washington, DC: Government Printing Office, June 2011), accessed 5 May 2015, http://www.dtic.mil/doctrine/new_pubs/jp3_08.pdf, xiii.

Delimitations

This study did not focus on installation energy and installation energy consumption, except as it pertains to policy. Solar power, wind energy, or nuclear alternative energy sources will not be addressed within this thesis except for comparative analysis of costs of R&D by service, etc.

Significance of the Study

Ideally, this study illustrated the complexity of the issues and policies, which guide the DOD involvement in biofuel R&D as well as DOD's influence on advancement of technology, research methods, and biofuels market promotion. The United States should strive for unity of effort, especially as it pertains to the DOD's R&D of alternative fuels.

CHAPTER 2

LITERATURE REVIEW

The body of literature that has been compiled on guidance, policies, and directives, which govern the DOD, is quite immense. National strategic guidance, reports from the White House and the administration, various congressional hearings, and literally dozens of studies, reports, and papers have been published on the various issues concerning the DOD's and the various military departments' parts in biofuels and alternative fuels R&D.

The NDAA of 2009 outlined the requirement for the SECDEF to call for a research study of alternate approaches to the reduction of greenhouse gasses, examine mobile in-theater tactical synthetic fuel processes, and a review of the individual service department's progress in meeting the goals of the energy initiatives of R&D as well as testing and certification of alternative fuels. The RAND Corporation was selected to conduct the study, which was completed in 2011. As per the guidance, the monograph, titled "Alternative Fuels for Military Applications" authored by James T. Bartis and Lawrence Van Bibber, gives a detailed analysis of the various implications and nuances of the U.S. national security in regards to importation of oil. It further examined opportunities to develop alternative fuels, which will lower greenhouse gas emissions. It discussed concepts and feasibility of military forward-based alternative fuel production and provides recommendations to the DOD on the program's suitability. This study clearly identified major issues with the DOD and the services conducting R&D of alternative fuels. It examined the capabilities of the various services and the part they are

playing in R&D and promoting commercial production and technology. The findings and recommendations of this study were particularly enlightening.

Following the RAND study, the Congressional Research Service released a report titled *Department of Defense Energy Initiatives: Background and Issues for Congress* by Moshe Schwartz, Katherine Blakeley, and Ronald O'Rourke. This study detailed how the DOD's reliance on fuel introduces risk and has an effect on the financial, operational, and strategic implications. It outlines the specific challenges the DOD faces with coordination of the various services and agencies involved in the nation's energy initiatives. The role of the DOD in these initiatives was also examined. In addition, it discussed the Navy's goals of implementing the initial stages of a domestic biofuels industrial base.

Opportunities for DOD Use of Alternative and Renewable Fuels: FY10 NDAA Section 334 Congressional Study outlined the pros and cons of the DODs use of renewable fuels. It detailed how the DOD is tasked under Section 334 of the NDAA to perform an "assessment of the use renewable fuels in non-tactical and tactical aviation, maritime, and ground transportation fleets and asks whether establishing a DOD commodity class for renewable fuels distinct from petroleum-based products would be beneficial."[22] Interestingly, the price tag of the study itself cost nearly $420 thousand dollars, while identifying that the DOD's use of biofuels could "potentially increase the cost of over $2 billion dollars in additional annual fuel costs by 2020."[23]

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[22] Department of Defense, *Opportunities for DOD Use of Alternative and Renewable Fuels: FY10 NDAA Section 334 Congressional Study* (Washington, DC: Department of Defense, July 2011), iii.

[23] Ibid.

Another Congressional Research Service report *The Navy Biofuel Initiative Under the Defense Production Act* by Anthony Andrews, Kelsi Bracmort, Jared T. Brown, and Daniel H. Else discusses the congressional debate on whether the Defense Production Act grants authorization to the military services, and in particular the U.S. Navy for biofuel development of industrial production facilities and markets.

The July of 2014 International Security Advisory Board report *Energy Geopolitics: Challenges and Opportunities* illustrates the various security concerns of the United States in respect to energy security and how increased domestic production from tight oil in North Dakota and Texas has changed the equation in regards to the nation's oil vulnerabilities. The report looks at the costs associated with traditional domestic oil production and biofuel and renewable fuel sources.

There are several articles and reports such as the report for *Air and Space Power Journal*, produced by Lieutenant Colonel Mark N. Goltz, Ph.D., USAF, Retired, and his colleagues Dr. Charles A. Bleckmann; Dr. Douglas M. Mackay; Major Khai Vuong, USAF; and Captain Jerrod P. McComb, USAF titled "Unintended Consequence: Potential Downsides of the Air Force's Conversion to Biofuels." This article discusses various problems and issues with the push toward biofuel usage in the U.S. Air Force. It describes potential subsurface environmental impacts, biofouling potential (the microbial spoilage of fuel), and other issues. It provides recommendations to develop technologies, testing, and to expand research of these issues. [24]

[24] Dr. Mark N. Goltz, LtCol, USAF, Retired; Dr. Charles A. Bleckmann; Dr. Douglas M. Mackay; Maj Khai Vuong, USAF; and Capt Jerrod P. McComb, USAF; "Unintended Consequences: Potential Downsides of the Air Force's Conversion to Biofuels," *Air and Space Power Journal* (Summer 2011): 41-46.

The Center for Strategic and International Studies has released numerous reports on energy strategy, budgets, and alternative fuel initiatives. The June 2014 report by Clark Murdock, Ryan Crotty, and Angela Weaver titled *Building the 2012 Affordable Military* discusses the impacts of sequestration on the military, and how and what the future force should look like. The study includes thorough insight on the budget to include Operation and Maintenance, Procurement, and Research, Development, Test and Evaluation.[25]

The 2010 QDR highlights energy and energy security as a major tenant of the document, and was written during a period when the budget was under less congressional scrutiny.[26] The 2014 QDR outlines the nation's strategy and clearly states that the military will have to thrive in an environment that is uncertain and that will require the military to operate under an ever-diminishing fiscal environment. It discusses how the United States will focus on rebalance of our forces while looking at "internal cost growth that is threatening to erode our combat power in this period of fiscal austerity."[27] The 2014 QDR details and highlights the current budget limitations and risk more so than it discusses energy security.

The 2010 NSS was written during a period of time when the country was just coming out of the recession of 2008 and was simultaneously fighting in Afghanistan and

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[25] Clark Murdock, Ryan Crotty, and Angela Weaver, *Building the 2021 Affordable Military* (New York: Rowman and Littlefield, 2014), 72.

[26] Secretary of Defense, *Quadrennial Defense Review* (Washington, DC: Department of Defense, 2010), iv.

[27] Secretary of Defense, *Quadrennial Defense Review* (Washington, DC: Department of Defense, 2014), iv.

Iraq. It described the need of building up the economy and investing in innovation and clean energy technologies.[28] The 2015 NSS describes how the United States has taken the lead as the "world's largest natural gas and oil producer . . . and our dependency on foreign oil is at a 20-year low."[29] Despite this, the NSS details the importance of energy security and looks at the nation's risks and the strategies that will mitigate them.

The Waterloo Institute for Complexity and Innovation published a paper by Navy Captain T.A. (Ike) Kiefer titled, "Twenty-First Century Snake Oil: Why the United States Should Reject Biofuels as Part of a Rational National Security Strategy." In this paper, the author argues that the science behind biofuels R&D have "physical limitations and negative consequences."[30] He describes thermodynamic properties and principles in an understandable format and discusses numerous factors such as energy return on investment. He describes that so called clean and green environmental goals can have an adverse effect on achieving energy security if the nation fails to understand the science behind it all.[31]

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[28] U.S. President, *National Security Strategy* (Washington, DC: The White House, May 2010), 10, accessed 29 March 2015, https://www.whitehouse.gov/sites/default/files/rss_viewer/national_security_strategy.pdf.

[29] U.S. President, *National Security Strategy* (Washington, DC: The White House, February 2015), 5, accessed 28 March 2015, https://www.whitehouse.gov/sites/default/files/docs/2015_national_security_strategy.pdf.

[30] Captain T. A. Keifer, "Twenty-First Century Snake Oil: Why the United States Should Reject Biofuels as Part of a Rational National Security Energy Strategy" (Paper No. 4, Waterloo Institute for Complexity and Innovation, University of Waterloo, Waterloo, Ontario, Canada, January 2013), viii.

[31] Ibid., 1.

Other research shows that there are various pro-biofuel camps. *Biofuels Digest* highlights perceived and realistic opportunities for investment within the industry and contains numerous global articles discussing technologies advancements and market risk, etc. This online magazine claims that it is "The world's most widely read biofuels daily."[32]

Overall, the review of the exhaustive amount of literature and studies on the policies that direct the DOD in respect to energy initiatives and strategy, details that there are numerous financial, operational, and strategic risks involved. Congress and our lawmakers need to take responsibility for alternative energy strategy policies that pertain to the DOD to ensure proper oversight and that milestones and goals are being met. Coordination inside the DOD between the various services as well as the leadership role the DOD is playing in regards to these initiatives, warrants study.

[32] *Biofuels Digest,* accessed 28 March 2015, www.biofuelsdigest.com/ bdigest/2015/Biofuels Digest,.

CHAPTER 3

METHODOLOGY

> Technical innovations—first widely applied to shale gas, and then to oil—have revolutionized the U.S. energy outlook. The United States is now the world's fastest growing oil producer, achieving what would have been unimaginable just a few years ago.
>
> — Honorable Gary Hart, in International Security Advisory Board, *Geopolitics: Challenges and Opportunities*

This paper provides a qualitative study using textual analysis to compare and contrast the policies, which instruct the SECDEF, the DOD and the individual services in order to better understand the DOD's role in biofuels and alternative energy research, development, and implementation. To accomplish this, the study outlined in detail the various issues, risks, costs, and associated potential oversight of the DOD's responsibilities and connected mission creep of the individual service's energy initiatives.

The study defines the some of the various types of alternative fuels and briefly described the processes for production with the associated pros and cons of each of the primary types. It also described the various initiatives each of the service secretaries has directly or indirectly tasked of the individual services. This study identified the complex coordination that must be achieved between DOD and the numerous U.S. government agencies and civilian enterprises in order to maximize effectiveness and efficiency of our nation's energy strategy.

Finally, this study conducted a comparison of the similar details and recommendations found in the various mandated studies that have been conducted by law which clearly detail the areas in which the DOD should focus. It also details the recommended role the DOD should play in regards to the nation's overall energy strategy

during a time of fiscal austerity. It also looked for gaps in the strategy, and at the specific risks from financial, operational, and strategic points of view and stresses overall that unity of effort in regards to the DODs role in alternative fuels is the key to success.

CHAPTER 4

ANALYSIS

Introduction

> We cannot keep going from shock to trance on the issue of energy security, rushing to propose action when gas prices rise, then hitting the snooze button when they fall again. The United States of America cannot afford to bet our long-term prosperity and security on a resource that will eventually run out. Not anymore. Not when the cost to our economy, our country, and our planet is so high. Not when your generation needs us to get this right. It is time to do what we can to secure our energy future.
>
> — President Barack Obama,
> *The Blueprint for a Security Energy Future*

President Obama's quote demonstrates the importance of energy security and the United States energy strategy. The quote demonstrates how this issue can elicit emotional response and the requirement to create policies to ensure the security of the nation. Yet, emotion and politics, (vice common sense, fiscal responsibility, and science), often drive policy makers to engage/create laws and policies that are convoluted with a lack of clear direction. The DOD lacks an efficient, effective program for development of alternative fuels due to: (1) the U.S. political process; (2) intergovernmental bureaucracy; and (3) the DOD budgeting process.

The DOD is the single largest consumer of petroleum in the U.S. government, yet the DOD represents less than 2 percent of the nation's total consumption.[33] As the government's largest consumer of petroleum, it seems to make sense that the DOD should play a role in the R&D of alternative and biofuels. What role should the DOD play? The administration seems to look at the DOD for leadership in respect to biofuels

[33] Andrews et al., 2.

and alternative energy. What about the other 98 percent? It makes sense that the Department of Energy, Department of Transportation, Department of Commerce, Department of Agriculture, as well as private industry should each play key leadership roles. In the fiscally austere environment that the DOD currently faces and at a time when the United States has increased its capacity to produce domestic petroleum products, the federal government has implemented costly research policies that promote and direct the DOD to develop alternative fuels and the markets that produce them. This seems out of place when strategic and operational funding dollars are scarce, and as of January of 2015, current traditional fuel sources are abundant and relatively inexpensive. "U.S. oil production remains near multi-decade highs, and crude-oil supplies stood at their highest level in about 80 years in the week ended January 30th, according to the U.S. Energy Information Administration."[34]

The sheer number of these various policies seem to lead to confusion of the priorities that guide the DOD. Within the DOD itself, the individual services each have created energy strategies and initiatives that do not necessarily nest with the other services or the DOD as a whole. The purpose of this paper is to study the various policies that have been set forth which dictate the DOD's role in the R&D of alternative and biofuel production technologies.

This chapter is organized into three parts. The first part is a historical political overview of U.S. energy policies. Part 1 discusses the various agencies created, policies developed, and strategies devised. This will provide a framework that identifies how the

[34] Nicole Friedman and Georgi Kantchev, "Oil Prices Post Biggest One-Week Gain Since 2011," *The Wall Street Journal*, updated 6 February 2015, accessed 7 January 2015, http://www.wsj.com/articles/oil-prices-rise-again-in-volatile-week-1423218645.

various presidential administrations have utilized the DOD and created various agencies to support those policies and directives. It identifies how the cyclical sway of national effort and the various policies follow the four-year presidential elections and two-year power changes in the House and Senate. It identifies how the roles of the DOD change with these cyclical power changes within the federal government. This part details how the DOD and the individual service secretaries and chiefs either correctly or incorrectly (with a lack of clear guidance) support the multitude of current government policies and federal guidance that deals with alternative and biofuel R&D for the DOD. It shows that the individual service secretaries each support of the R&D of alternative fuels, but do so under their own particular individual political agendas and budgetary limitations.

Part 2 describes the intergovernmental bureaucracy and the various policies, which provide (specific or not so specific) guidance to the DOD. It shows how these ups and downs in priorities effect the nation's energy strategy. The study will attempt to show that strategies are nested with the other agencies and the national strategy. Part 2 describes how the DOD attempts follow the guidance given, or with a lack of clear guidance, how the DOD and the individual service secretaries create their own initiatives. In some instances, the services have set goals that may not be nested with the DOD's overall energy strategy.

Part 3 will look at how the DOD budgeting process driven by the QDR, NDAA, and various memorandums of understanding (MOUs) impact the strategies and initiatives created by the individual services. These budgetary pendulum swings are detrimental to long-term success in regards to R&D of alternative fuels. During periods of increased funding and political backing, tremendous gains are often made. However, during the

present period of sequestration and competition for funding, many projects that have made tremendous strides in research and demonstrate significant levels of investment are pushed to the wayside by the individual services in order to meet the current operational and budgetary realities.

Part 1: Historical Political Overview of U.S. Energy Policies

For more than one hundred years, our various administrations and Congress have been concerned with the availability of domestic fuel resources and the capability of conventional and synthetic fuels production as it pertains to national defense.[35] The process of strategy development cycles with the current geopolitical platforms. In times of peace and prosperity, concern for our energy strategy diminishes. In times of national peril or state of war, national security and our energy strategy becomes forefront. Throughout this period, the DOD has played a significant role in regards to the overall energy strategy of the nation, often beneficial and other times somewhat questionable. The DOD's role in support of the nation's energy strategy is cyclical and follows the political and bureaucratic conditions of the period. One of the first examples of forsight for our nation's early energy strategy which empowered the military was The Pickett Act of 1910. With good intentions, Congress saw the need to set aside oil reserves in Wyoming and California for the U.S. Navy to use and protect as part of the national defense. This was soon followed in 1920 by a naval appropriation bill which granted the Secretary of the Navy (SECNAV) the ability to "to conserve, develop, use and operate the same in his discretion, directly or by contract, lease, or otherwise, and to use, store,

[35] Andrews et al., 4.

exchange, or sell the oil and gas products thereof, and those from all royalty oil form lands in the naval reserves, for the benefit of the United States."[36] Although seemingly well intended, the Navy allowed and granted noncompetitive leases which quickly erupted into a scandal known as The Teapot Dome.[37] This scandal was an early example of misuse of authority by the Navy Department. It also clearly identified the need to transform leasing business practices to ensure open competive bidding processes were enforced. It also proved that the taxpayer needed proper protection and that the federal government should grant powers and authorities with caution and develop federal laws to provide oversight of business practices to ensure that contracts were awarded to the lowest bidder. The political climate of the time coupled with the nature of this scandal, Congress decided to sell the lands and release the oil reserves for private production. The scandal and negative publicity, as well as political and budgetary atmosphere of the day, forced Congress to give the Navy's Naval Petroleum Reserves and Naval Oil Shale Reserves to the Department of the Interior.[38] The period followed by the Great Depression demonstrated a low point for our political concern for an energy strategy.

The inevitability of World War II reversed the cycle again and brought on an even more distinct need for the federal government to have a robust energy strategy. The nation was galvanized in its resolve to win the war, as were the Germans. Prior to the war, the Germans where quite successful in the development of synthetic fuels from the vast coal deposits, yet it took over a two decades and the complete commitment of the

[36] Andrews et al., 4.

[37] Ibid.

[38] Ibid.

Nazi government.[39] Although everything Hitler did played a major role in the Nazi war effort, he did not place this project under military supervision. Hitler made the synthetic fuel industry a top priority, properly placing it under the (Reich Offices) Ministry of Economics, the Office of Mineral Oils, Office of Raw Materials, and the Economic Group of Liquid Fuels respectively.[40] Seeing the success the Germans realized with their synthetic fuels production, Congress authorized the U.S. Synthetic Liquid Fuels Act of 1944 to aid the nation's efforts in the war and to conserve and increase the natural oil resources. This act, following the German example, empowered the Secretary of the Interior, vice the DOD, with the construction, maintenance, and operations associated with all facets of synthetic fuel production.[41] The Secretary of the Interior, who was responsible for the nation's natural resources, was tasked to use the the nation's abundant natural resources of coal, forestry, shale, and agricultural products to produce synthetic fuels.[42] Congress understood that putting this office in the lead for the production and development of domestic synthetic fuels made perfect sense, proving that the members of Congress fully understood the roles, purpose, and mission of the Secretary of the Interior at that time. Utilizing captured German scientists and technology, the United States began to produce synthetic fuels.[43] Following the war, the nation's political climate and post-

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[39] Anthony N. Stranges, "Germany's Synthetic Fuel Industry 1927-45," Historical Development of the Fischer-Tropsch Synthesis Process–I (Presentation at the AIChE 2003 Spring National Meeting, New Orleans, LA, 30 March-3 April 2003), 10.

[40] Ibid.

[41] Andrews et al., 4.

[42] U.S. Department of the Interior, "Mission Statement," accessed 23 December 2014, http://www.doi.gov/whoweare/Mission-Statement.cfm.

war budget forced interest in synthetic fuels to wane due to extreme differences in the costs of synthetic fuels versus petroleum products.

Following WWII and amidst the Korean conflict, the defense of the nation (to include energy security) was again at the forefront. In an attempt to strengthen the energy strategy, lawmakers established The Defense Production Act of 1950 (DPA). This legislation identified a broad set of powers and a series of criteria which placed the national security and the needs of the military as priority for production and contractual agreements for refining and distribution of fuels.[44]

> Congress finds that—
>
> (1) the security of the United States is dependent on the ability of the domestic industrial base to supply materials and services for the national defense and to prepare for and respond to military conflicts, natural or man-caused disasters, or acts of terrorism within the United States;
>
> (2) to ensure the vitality of the domestic industrial base, actions are needed—[45]

The DPA of 1950 underpins virtually all of the energy legislation and strategies that have been created since its inception. This act gives authority to the president (vice the DOD) to support national defense by protecting and ensuring the industrial base of the nation is postured to provide the resources and technolgy to support the national defense.[46]

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[43] Office of Fossil Energy, "Our History."

[44] Bartis and Van Bibber, XV.

[45] Defense Production Act of 1950, as amended October 2009, Public Law 111-67, 50 U.S.C App. § 2061 et seq., accessed 31 January 2015, http://www.fema.gov/media-library-data/20130726-1650-20490-9035/the_defense_production_act_of_1950.txt, sec. 1.

[46] Ibid., sec. 303.

Congress understood that authorizing President Harry S. Truman this power would protect the industrial base and the energy security.

In an exerpt below of the DPA of 1950. section 303 clearly shows the powers assigned to the president.

> Sec. 303. Other Presidential Action Authorized [50 U.S.C. App. § 2093]
>
> (a) In General
>
> (1) In general—To create, maintain, protect, expand, or restore domestic industrial base capabilities essential for the national defense, the President may make provision—
>
> (A) for purchases of or commitments to purchase an industrial resource or a critical technology item, for Government use or resale;
>
> (B) for the encouragement of exploration, development, and mining of critical and strategic materials, and other materials;
>
> (C) for the development of production capabilities; and
>
> (D) for the increased use of emerging technologies in security program applications and the rapid transition of emerging technologies—
>
> (i) from Government-sponsored research and development to commercial applications; and
>
> (ii) from commercial research and development to national defense applications.[47]

The DPA has been reauthorized and ammended numerous times since the legislation was first appoved. It is from this legislation and the modifications to it over time, that grant the president authority to promote domestic industrial capabilities base, facilities and resource management in times of war and civil emergencies. The DPA also

[47] Defense Production Act of 1950, sec. 303.

provides legal description for oversight and waivers for the domestic production of resources and technologies.

Following the U.S. support of Israel during The Yom Kippur War of 1973, several Arab oil producers attempted to punish the United States.[48] The nation's energy security was again threatened. The 1973 oil embargo, established by the Organization of Oil Producing Countries, sent fuel prices skyward, and caused American citizens to push lawmakers into action.[49] The Energy Reorganization Act of 1974 was quickly signed into law and established the Energy Research and Development Administration. This reorganization removed the Office of Coal Research from under the Interior Department and put it under the Energy Research and Development Administration and pulled the synthetic fuels program from the Bureau of Mines. The Energy Research and Development Administration would focus on the nation's fossil fuel programs. [50] Natural gas shortages and unrest in the Middle East caused President Jimmy Carter to sign into law the Department of Energy Reorginization Act which merged nearly 30 different energy functions to include the Energy Research and Development Administration creating the U.S. Department of Energy (DOE).[51]

On 1 October 1977, the DOE became the lead agent in the direction for the commercial production of synthetic fuels, which included coal liquefaction, gasification,

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[48] Elizabeth Stephens, "The Yom Kippur War," *History Today* 58 (10 October 2008), accessed 19 March 2015, http://www.historytoday.com/elizabeth-stephens/yom-kippur-war.

[49] Office of Fossil Energy, "Our History."

[50] Ibid.

[51] Ibid.

and oil shale technology.[52] Although the establishment of the DOE put it in the lead, the military services did not turn their backs on alternative fuels. During the 1970s, the Navy's Naval Petroleum and Oil Shales Reserves Office conducted numerous tests to establish the suitability of oil-shale distillates use in JP-4.[53] The U.S. Air Force also began to test and certify oil-shale derived JP-4 jetfuel. The Air Force also awarded contracts to develop technology for the production of oil-shale JP-4.[54] This was a direct example of the Air Force and the Navy conducting redundant R&D actions and was counterintuitive to the mission of the newly established DOE. A lack of clear guidance to each of the services from the DOD, as well as interservice stove piping and overall lack of coordination was evident.[55] The services' individual strategies were not clearly nested with the nation's overall energy strategy.

During the1980s, in an effort to reduce the federal deficit, the House wanted a bill to abolish the Synthetic Fuels Corporation. [56] Congress felt that the Strategic Petroleum Reserve was the "most cost effective defense against another oil embargo than subsidizing synthetic fuels."[57] Again, the political and budgetary climate effectively put a stop to the U.S. synthetic fuels program.

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[52] Andrews et al., 5.

[53] Ibid.

[54] Ibid.

[55] Ibid.

[56] Ibid., 6.

[57] Ibid.

As every crisis in the past has shown, the terrorist attacks of 9/11 highlighted the nation's security situation. This has led to numerous policies that attempt to address this nation's dependence on foreign oil. The political climate showed a clear emphasis on energy security. So called green energy and the nation's energy dependence became the newest buzz words. Oil prices soared to record highs, and since that time, the United States and the DOD has spent hundreds of millions of dollars researching and developing, testing and certifying alternative fuels as a substitute for petroleum based products. After oil prices above one hundred dollars a barrel dropped to roughly fifty dollars per barrel, the need to create alternative fuels has been greatly lessoned.[58] However, in 2012, Obama declared that "biofuels are an important part of reducing America's dependence on foreign oil and creating jobs here at home."[59]

The political process is cyclic and directly tied to the market place and the nation's economy. These cycles lead to inconsistant efforts by the government to produce policies. These well intentioned, short-term policies often lead to long-term consequences. Intergovernmental bureaucracy and budgetary realities adversely effect long-term projects and processes; especially those as complex as the research and developent of alternative fuels, and the markets that would support them.

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[58] Paul Ausick, "Low Crude Oil Prices Leave Thousands of US Wells Uncompleted," *Wall Street 24/7,* 12 April 2015, accessed 12 April 2015, http://247wallst.com/energy-business/2015/04/12/low-crude-oil-prices-leave-thousands-of-u-s-wells-uncompleted/.

[59] Noah Shachtman, "How the Navy's Incompetence Sank the 'Green Fleet'," *Wired*, 17 July 2012, accessed 3 May 2015, http://www.wired.com/2012/07/green-fleet/.

Part 2: Intergovernmental Bureaucracy and Alternative Fuels

With the onset of war following 9/11, there seemed to be no shortage of money or policies that direct how to spend it. Hundreds of millions of dollars have been spent by the DOD to develop alternative fuels.[60] Yet, the DOE has the mission of developing and managing the nation's energy. It seems clear that the DOE should play the lead role in developing technology and promoting commercial production to provide for our nation's energy security, but the multiple levels of intergovernmental bureaucracy and individual political agendas tend to blur the lines of responsibility: "The mission of the Energy Department is to ensure America's security and prosperity by addressing its energy, environmental and nuclear challenges through transformative science and technology solutions."[61]

The DOE operates and federally funds 17 different labratories across the nation.[62] These facilities are chartered to work closely with the National Science Foundation, the National Institutes of Health, and the DOD.[63] The DOE's support of technological innovation is no small matter. The DOE is the crucial connection in support of the mission of technological advancements. It ensures the "intellectual vitality of the U.S. technical enterprise by sponsoring research at 540 colleges and universities and

[60] Bartis and Van Bibber, iii.

[61] Energy.gov, "Mission," U.S. Department of Energy, accessed 7 February 2015, http://energy.gov/mission.

[62] Energy.gov, "About the National Labs," U.S. Department of Energy, accessed 7 February 2015, http://energy.gov/about-national-labs.

[63] U.S. Department of Energy, DOE/CF-0067, *Strategic Plan* May 2011, accessed 7 February 2015, http://energy.gov/sites/prod/files/2011_DOE_Strategic_Plan_.pdf, 7.

supporting approximately 5,800 faculty and postdoctoral fellows and 3,600 graduate students."[64] The magnatude of intellect this represents dwarfs the DOD laboratories in comparison. It confirms the important role that the DOE plays, and why it should continue that role for national defense energy security. Below is an exerpt that clearly shows the mission and responsibilities of DOE national labs.

> Specifically, the National Laboratories:
>
> - Conduct research of the highest caliber in physical, chemical, biological, and computational and information sciences that advances our understanding of the world around us;
>
> - Advance U.S. energy independence and leadership in clean energy technologies to ensure the ready availability of clean, reliable, and affordable energy;
>
> - Enhance global, national, and homeland security by ensuring the safety and reliability of the U.S. nuclear deterrent, helping to prevent the proliferation of weapons of mass destruction, and securing the nation's borders; and
>
> - Design, build, and operate distinctive scientific instrumentation and facilities, and make these resources available to the research community.[65]

As identified in the second bullet above of the DOE labratories' mission, the advancement of clean energy technologies and affordable energy are mandated in the charter, but are often seen as a dichotomy or in direct opposition of one another. The DOE and its labratories are charged with discovering and developing technological advancements and then helping those technologies reach the market place.[66]

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[64] U.S. Department of Energy, *Strategic Plan,* 7.

[65] Energy.gov, "About the National Labs."

[66] U.S. Department of Energy, *Strategic Plan,* 2.

To accomplish this task, the DOE must provide a means by which the technologies reach the market place. DOE plays a key role by providing funding of research, and fosters the technology and innovation, and utilizes the discoveries in research, development, demonstration, and deployment.[67] "In addition to advancing science and technology relevant to energy, the environment, and security, the Department of Energy is the government's largest financial supporter of the physical sciences, managing world-class basic research programs and supporting unique user facilities in a variety of disciplines."[68]

Clearly, the DOE is organized, trained, equipped and has the personnel, facilities, intellectual expertise, department level authority, and mandates to lead the nation's research efforts, technological advancements, and market development of biofuels and energy markets. It is important to note that most of the energy infrastructure is owned and operated by the private sector. Conventional oil resources dominate the marketplace, but there are many levels of bureaucracy within this complex system. The DOE's strategy is to prioritize resources and work to leverage the various departments such as the US Environmental Protection Agency, the Department of Commerce, Department of Agriculture, Department of Transportation, and Department of the Interior.[69] The size and number of these agencies adds considerable layers to the alternative fuel production bureaucracy.

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[67] U.S. Department of Energy, *Strategic Plan,* x, 2.

[68] Ibid., 1.

[69] Ibid., x, 11.

Why does the DOD do so much if the DOE is responsible for alternative fuels? To add to the level of bureaucracy, in May of 2006, the SECDEF established an Energy Security Task Force to study energy considerations for business and planning processes.

This was followed by The Energy and Security Act of 2007, which was passed with a goal of increasing the nation's energy independence, but does not provide much guidance to the DOD.[70] The Energy and Security Act of 2007 put in another layer of bureaucracy by adding an environmental restriction on Green House Gases to the DOD's attempts to purchase alternative fuels.

> EISA was enacted on December 19, 2007. Section 526 of this law, which pertains to U.S. government purchases of alternative fuels, states the following:
>
> No Federal agency shall enter into a contract for procurement of an alternative or synthetic fuel, including a fuel produced from nonconventional petroleum sources, for any mobility-related use, other than for research or testing, unless the contract specifies that the lifecycle greenhouse gas emissions associated with the production and combustion of the fuel supplied under the contract must, on an ongoing basis, be less than or equal to such emissions from the equivalent conventional fuel produced from conventional petroleum sources.[71]

As previously discussed, each of the military services has been involved with the R&D of alternative fuels, but was any oversight done to protect the taxpayer and to ensure efficiency? How does the DOD conduct R&D?

The Defense Adanced Research Project Agency (DARPA), is the military's premier organization by which the DOD supports the nation's energy strategy. President Dwight D. Eisenhower created the Advanced Research Projects Agency in 1958,

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[70] U.S. Congress, House, *Energy Independence and Security Act of 2007.*

[71] Michael E. Canes and Rachael G. Jonassen, Report DES86T1, *EISA Section 526: Impacts on DESC Supply* (Tysons, VA: LMI Government Consulting, March 2009), 2-1.

following the Soviet launch of Sputnik to prevent technological surprises to the government and to present surprises to enemies.[72] An agency within the DOD, DARPA's mission is to provide funding and research that directly supports military applications. DARPA's recent opening of its Biological Technologies Office is a move in the right direction for the military's part in biofuel research, yet adds another layer to the bureaucracy. "The mission of the Biological Technologies Office is to foster, demonstrate, and transition breakthrough fundamental research, discoveries, and applications that integrate biology, engineering, and computer science for national security."[73]

The Biological Technologies Office enables the DOD to have a venue that "looks at biology as a technology, with a focus on harnessing living systems or integrating those systems with nonliving systems."[74] The Biological Technologies Office is a vital tool in the nation's biofuel strategy and in respect to biofuel research.

The NDAA for Fiscal Year (FY) 2009 directed the SECDEF to conduct an R&D study of fuel costs and required the DOD to factor life-cycle cost analysis of new

[72] Defense Advanced Research Projects Agency, "About DARPA, History," accessed 31 January 2015, http://www.darpa.mil/About/History/History.aspx.

[73] Defense Advanced Research Projects Agency, "Our Work, BTO," accessed 31 January 2015, http://www.darpa.mil/our_work/BTO/.

[74] Defense Advanced Research Projects Agency, "News Events Releases," 6 November 2014, accessed 31 January 2015, http://www.darpa.mil/NewsEvents/Releases/2014/11/06.aspx.

equipment and technologies into the acquisition process. This requirement has been a direct factor in program and technology design specifications and parameters.[75]

This study, sponsored by the Defense Logistics Agency Energy and conducted by the RAND National Defense Research Institute was tasked to "review of the goals and progress of the military departments in the research, testing, and certification of alternative fuels."[76]The results found in this study were quite compelling and clearly showed that there was lack of unity of effort amongst the services. Although each of the services has invested significant time, money, and efforts in developing alternative fuels for use in tactical weapons systems, the study found that neither Congress nor the SECDEF has specifically tasked the services to do so.[77] It seems each of the services are following the mission command premise of the guidance set forth by the individual service chiefs, thereby conducting research and spending considerable time and money without clear guidance from the SECDEF or Congress. The study found that each service has its own set of goals and that none of them are working together. In addition, DARPA and Defense Logistics Agency Energy have established programs to produce and develop alternate fuels; yet again, they lack unity of effort with the overall defense energy security strategy.[78]

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[75] Assistant Secretary of Defense for Operational Energy, Plans and Programs, *Energy for the Warfighter: Operational Energy Strategy*, 8.

[76] Bartis and Van Bibber, iii.

[77] Ibid., ix.

[78] Ibid., x.

The study had six major findings of relevance to this thesis:

1. The study agrees with the overall premise that developing a competitive alternative fuel industry in the United States offers important benefits to the nation.

2. The study clearly stated that there is no direct benefit to the Department of Defense or the services from using alternative fuels rather than petroleum-derived fuels.

3. DOD research, alternative fuel testing, and promotion of early commercial production will benefit the nation as a whole more so than the DOD or the services.

4. DOD's technology-development efforts overemphasize early demonstration and underestimate the difficulty of developing alternative fuel technologies that offer acceptable economic and environmental performance. This finding highlights that most of the DOD research projects are conducted independently, and focus on a single engineering concept.

5. Large-scale testing and certification of hydrotreated renewable oils is premature. This finding directly quotes the high cost ($400 per gallon) that DLA Energy and the Navy paid for hydrotreated oils and that the services should be patient and conduct the tests when hydrotreated renewable oils become less expensive and commercially available.

6. Current Department of Defense contracting authority is inadequate to allow DOD to cost-effectively promote early industrial production of alternative fuels. It claims the $500 million contract limit the five-year contract duration inhibits investment in alternative fuels production.[79]

The findings of this study clearly indicated to Congress and the SECDEF that the energy security strategy of the nation required some major improvements.

The FY2010 NDAA Congressional study, *Opportunities for DOD Use of Alternative and Renewable Fuels* outlined the pros and cons of the DOD's use of renewable fuels. It detailed how the DOD is tasked under Section 334 of the NDAA to perform an "assessment of the use renewable fuels in non-tactical and tactical aviation,

[79] Bartis and Van Bibber, 81, 83, 84, 85.

maritime, and ground transportation fleets and asks whether establishing a DOD commodity class for renewable fuels distinct from petroleum-based products would be beneficial."[80] Interestingly, the price tag of the study itself cost nearly $420 thousand dollars; while the study identified that the DOD's use of biofuels could "potentially increase the cost of over $2 billion dollars in additional annual fuel costs by 2020."[81]

What role should the Department of State (DOS) play? The White House released *The Blueprint for A Secure Energy Future 2012*, which discussed how the nation must develop next generation fuel technologies.[82] This document mentioned the DOD only once with a description of "Scaling up New Technologies" to reduce DOD's long-term energy costs and to improve energy security.[83] This document did not provide specific guidance to the DOD on how to achieve the goals or describe what part the DOD should play in R&D of biofuels. It did, however provide yet another venue (or layer of bureaucracy) to shape the nation's energy strategy. The document had three tenants; develop and secure America's energy supplies, provide consumers choices to reduce costs and save energy, and innovate our way to a clean energy future.[84]

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[80] Department of Defense, *Opportunities for DOD use of Alternative and Renewable Fuels*, iii.

[81] Ibid.

[82] U.S. President, *Blueprint for a Secure Energy Future* (Washington, DC: The White House, 30 March 2011), 6-8, accessed 4 November 2014, http://www.whitehouse.gov/sites/default/files/blueprintsecureenergyfuture.pdf.

[83] Ibid., 42.

[84] Ibid., 2.

Following the administration's vision, during that same year, the DOS created the Bureau of Energy Resources, which identified energy as a central role for diplomatic priorities.[85] In a 2014 report titled *Energy Geopolitics: Challenges and Opportunities*, the International Security Advisory Board (for the DOS) recommended that DOS should "take the lead, along with Energy and Commerce Departments, in engaging private sector (especially the energy sector) in crafting viable national energy strategies for the United States."[86] The report detailed that DOS does not utilize the U.S.'s ability to leverage energy over other countries. It also highlighted that the nation's energy strategy is made up of numerous policies, directives, statutes, and executive orders that create complexity and do not make for an integrated energy strategy.[87]

The layers of intergovernmental bureaucracy directly inhibit efficient advancement of the R&D of alternative fuels by the DOD. Although well intentioned, the numerous policies and directives do not provide clear guidance to the military services. This lack of unity of effort decreases efficiency and costs the taxpayers money.

Part 3: Cyclic Budgets and Energy Initiatives

Part 3 will look at how DOD budgets driven by the QDR, NDAA, the DPA, and various MOUs impact the costly strategies and initiatives created by the individual services. These budgetary pendulum swings are detrimental to long-term success in regards to R&D of alternative fuels. During periods of increased funding and political

[85] International Security Advisory Board, *Energy Geopolitics: Challenges and Opportunities* (Washington, DC: Department of State, 2014), A-2.

[86] Ibid.

[87] Ibid.

backing, tremendous gains are often made. However, during the present period of sequestration and competition for funding, many projects that have made tremendous strides in research and demonstrate significant levels of investment are pushed to the wayside by the individual services in order to meet the current operational and budgetary realities.

As mentioned, a critical part of alternative fuel R&D is the considerable financial commitment of the DPA.[88] The current amendment to this document (The DPA of 1950, as amended 2009) states that the U.S. Treasury shall provide 750 million dollars annually to the fund each fiscal year. The purpose of the fund is to make loans available to promote small business, production facility improvements, purchase industrial resources, encourage markets, and supports the production or supply of an industrial resource or critical technology/processes critical to the national defense.[89] The DPA and its amendments, which utilize the DPA fund as the way by which the federal government should support and provide the means to support small businesses to develop alternative fuel markets and production facilities thereby encouraging the production of biofuels. The DPA has been the proven and proper venue for the support of the nation's energy security strategy for nearly 65 years. The DPA provides the ways and means by way of authorities and funding by which the federal government and president can ensure the nation's energy security. The power of these authorities found in the DPA to safeguard markets, promote, and give priority to the defense industrial base requires safeguards and proper oversight.

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[88] Defense Production Act of 1950, sec. 304.

[89] Ibid., sec. 302.

While the DOE has its own operational funds, as well as the DPA to execute its mission, why did the DOD need to invest significant portions of its operational and R&D budget to R&D of alternative fuels vice the DOD R&D traditional role of producing weapons systems and enablers? Between May of 2009 and January 2010, the DOE made nearly 350 million dollars in funds available from the American Recovery and Reinvestment Act for R&D of biofuels.[90] Is it because the DOE leverages the DOD, or does the DOD follow its own agenda?

The political climate of each administration causes shifts in priorities of policies and causes inefficiencies as demonstrated by the 2010 QDR, which was written during a period of concerns for energy security and the environment.[91] "In FY2000, fuel costs represented 1.2 percent of the total DOD spending, but by FY2008 fuel costs had risen to 3.0 percent. Over the same time, total defense spending had more than doubled, but fuel costs increased nearly 500 percent"[92] Statistics like these cause the administration, politicians, and taxpayers to react quickly with energy security legislation.

The 2010 QDR seemed to reflect a period with less emphasis on budgets and more emphasis on energy. The word energy was used more than 50 times in the document in various ways describing security and technology, while the 2014 QDR used

[90] Bartis and Van Bibber, 53.

[91] Secretary of Defense, *Quadrennial Defense Review*, 2010.

[92] Andrews et al., 2.

the word energy only 13 times. The word budget is used only 28 times in the 2010 QDR, while the 2014 QDR used it 73 times.[93]

Energy security certainly was a priority to the SECDEF Robert M. Gates, and this migrated into the 2010 QDR. Buzz words like green and energy security and dependence were a sign of the times, and spoke much of the political environment of 2010, while budget woes dominated during the writing of the 2014 QDR. The political state of the nation in the years preceding the 2010 QDR helped shape the guidance and the descriptions of the initiatives targeted by the various services. Using the authority and intent of the DPA, the QDR also mentioned strengthening the industrial base and described a need to produce a long-term strategy for shaping future technologies and to, "better account for the rapid evolution of commercial technology."[94]

SECDEF Gates thus gave somewhat vague guidance to his military service secretaries and service chiefs. In a speech to the Senate Armed Services Committee on 27 January 2009, he stated, "the spigot of defense spending that opened on 9/11 is closing," and that the DOD would have to make "hard choices" to deal with budgetary realities.[95]

In response to the 2010 QDR, the DOD and the newly designated Assistant Secretary of Defense for Operational Energy Plans and Programs ASD(OEPP) produced a document called *Energy for the Warfighter: Operational Energy Strategy*.[96] The

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[93] Secretary of Defense, *Quadrennial Defense Review,* 2010; Secretary of Defense, *Quadrennial Defense Review,* 2014.

[94] Secretary of Defense, *Quadrennial Defense Review,* 2010, xv.

[95] Murdock, Crotty, and Weaver, 1.

[96] Assistant Secretary of Defense for Operational Energy, Plans and Programs, *Energy for the Warfighter: Operational Energy Strategy,* intro.

mission of the ASD(OEPP) is to provide oversight and guidance in the promotion of military energy security.[97] This 21-page strategy contained literally three paragraphs that described R&D of alternative fuels and it cost approximately $300,000 dollars to produce.[98]

This strategy mandated that DOD shall: "Establish a joint, integrated policy and investment strategy for alternative fuels RDT&E, with guidance and oversight from the ASD(OEPP)."[99] Yet, each service attempted to create individual service policies that would meet the intent of the SECDEF and the 2010 QDR.

This document included an appendix which described each of the different "Services Energy Visions":

> Appendix: Service Energy Visions
>
> Army: An effective and innovative Army energy posture, which enhances and ensures mission success and quality of life for our Soldiers, Civilians and their Families through Leadership, Partnership, and Ownership, and also serves as a model for the nation.
>
> • Reduced energy consumption
>
> • Increased energy efficiency across platforms and facilities
>
> • Increased use of renewable/alternative energy
>
> • Assured access to sufficient energy supplies
>
> • Reduced adverse impacts on the environment
>
> Navy: Our Energy Vision is a Navy that values energy as a strategic resource; a Navy that understands how energy security is fundamental to executing our

[97] Ibid.

[98] Assistant Secretary of Defense for Operational Energy, Plans and Programs, *Energy for the Warfighter: Operational Energy Strategy*, 8.

[99] Ibid., 9.

mission afloat and ashore; and a Navy that is resilient to any potential energy future.

• Assure Mobility and Protect Critical Infrastructure

• Lighten the Load and Expand Tactical Reach

• Green the Footprint

Air Force: Make Energy a Consideration In All We Do. Achieving the Air Force energy vision involves establishing a clear picture of how energy impacts the Air Force's critical capabilities: Global Vigilance, Global Reach, and Global Power. Energy must be recognized as the base ingredient for Air Force missions and operations. By considering energy in every mission and organization, the Air Force can leverage energy as a combat enabler and increase its energy security posture.

• Reduce Demand

• Increase Supply

• Culture Change

Marine Corps: To be the premier self-sufficient expeditionary force, instilled with a warrior ethos that equates the efficient use of vital resources with increased combat effectiveness.

• Instill an Ethos

• Increase Energy Efficiency in USMC Equipment and Installations

• Increase Use of Renewable and Alternative Energy[100]

The previous appendix from the *Energy for the Warfighter*: *Operational Energy Strategy* listed the vision of each of the services, but not how each service was going to accomplish it. Each service's vision is clearly different from the others, and all contain broad goals and lack specificity. This showed that each of the services attempted to create

[100] Assistant Secretary of Defense for Operational Energy, Plans and Programs, *Energy for the Warfighter: Operational Energy Strategy*, 12.

energy initiatives that were not nested with the national strategy and generated multiple levels of unwarranted bureaucracy within the services and the DOD.

Where does DOD receive guidance for its role for R&D? The DOE established a MOU with the DOD to establish a partnership following the 2010 QDR, which tasked the DOD "to partner with other US agencies to research, develop, test, and evaluate new sustainable energy technologies."[101] The MOU states and clearly identified, "the DOE is the lead Federal agency for development of advanced energy technologies, yet DOD will need to invest in many of these same energy technologies as well as other energy technologies which may be unique to DOD's operational requirements."[102] The risk with this MOU was redundancy, duplication of effort and lack of a clearly nested strategy. It also included a significant funding investment by the DOD.

The 2010 QDR tasked the DOD to duplicate many of DOE's mandated missions in regards to R&D of biofuels. Depending on the lens through which you look at this, the MOU is absolutely in line with DOE's intent to promulgate the nation's R&D of alternative fuels by utilizing various agencies, colleges, and universities for the overall good of the scientific community writ large. However, the DOD was tasked to duplicate efforts (at considerable cost) and added numerous levels of bureaucracy in order to

[101] Deputy Secretary of Energy and Deputy Secretary of Defense, Memorandum of Understanding between U.S. Department of Energy and U.S. Department of Defense, "Concerning Cooperation in a Strategic Partnership to Enhance Energy Security," July 22, 2010, accessed date, http://energy.gov/sites/prod/files/edg/media/Enhance-Energy-Security-MOU.pdf, 1.

[102] Ibid.

follow policies and intentions of the QDR which caused duplication of effort and mission creep in regards to biofuels and alternative fuel research and production.[103]

The MOU used the term "force multiplier" to describe energy efficiency, which makes sense and seems well intended.[104] Yet, this relationship clearly enhanced the DOE's mission while it simultaneously channeled funding, resources, and most importantly operational focus away from the DOD's mission. Clearly, some sort of oversight and guidance must be required for these types of immense and costly programs.

The NDAA of 2009 outlined the requirement for the SECDEF to call for a research study of alternate approaches to the reduction of greenhouse gasses, examine mobile in-theater tactical synthetic fuel processes, and a review of the individual service department's progress in meeting the goals of the energy initiatives of R&D as well as testing and certification of alternative fuels.[105] The RAND study found that the nation's goal to develop an alternative fuel industry is sound and, "offers important benefits to the nation."[106] Yet, it finds that concerning the military use of alternative fuels that, "There is no direct benefit to the Department of Defense or the services from using alternative fuels rather that petroleum-derived fuels."[107] The benefits of the services' work in alternative fuel research and market development is clearly a benefit to the commercial industry vice

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[103] Secretary of Defense, *Quadrennial Defense Review*, 2010, 87.

[104] Deputy Secretary of Energy and Deputy Secretary of Defense, Memorandum of Understanding between U.S. Department of Energy and U.S. Department of Defense, 2.

[105] Bartis and Van Bibber, iii.

[106] Ibid., 81.

[107] Ibid., 83.

the DOD.[108] Yet, each service has implemented extensive costly investments into service specific energy initiatives.

> According to this report, the Navy will need to buy 336 million gallons of renewable fuel per year in order to meet its aim. Each gallon will cost between $1.43 and $5.24 more than petroleum. Which means the Navy could wind up spending an extra $1.76 billion annually on biofuels (.pdf). In comparison, a new destroyer costs about $1.6 billion, at a time when the shipbuilding budget is getting cut.[109]

DARPA's support of the DOD mission includes many long-term projects, but budgetary realities can adversely affect these initiatives. DARPA's fiscal year 2013 budget received a Congressional Add of nine million dollars to research alternative approaches to biofuel production. This Congressional Add for biofuels represented approximately 30 percent increase of DARPA's BIO-INFO-MICRO Sciences budget for that FY to more than $31 million.[110] FY 2014 saw a decline to 24.8 million and 2015 budget is set at 21.1 million dollars divided amongst the BIO-INFO-MICRO Sciences division (BLS-01). Although, the detail of the budget document did not show the total that would be used for strictly biofuel research during these FYs.[111] For comparison,

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[108] Ibid., iii.

[109] Shachtman.

[110] Defense Advanced Research Projects Agency, *Department of Defense Fiscal Year (FY) 2015 Budget Estimates*, vol. 1-134 (Washington, DC: Department of Defense, March 2014), 2.

[111] Defense Advanced Research Projects Agency, *Department of Defense Fiscal Year (FY) 2015 Budget Estimates*, vol. 1-1 (Washington, DC: Department of Defense, March 2014), 2.

Cyber Sciences division's (CYS-01) budget was increased from 17 million dollars in FY2013 to 26 and 28 million dollars in FY 2014 and 2015 respectively.[112]

In the 2014 QDR, SECDEF Hagel describes his vision of the future course the military will take. The guidance and the priorities seem difficult at best, and with the budget situation, seem almost unatainable. He claims, "We will prioritize combat power by reducing unnecessary overhead and streamlining enterprise."[113] Yet, he also said "we are in a period of fiscal austerity and must maintain the world's finest fighting forces."[114] To do this, he says the military will reduce force structure, modernize the forces, and invest in the technological edge over the nation's adversaries.[115] With force structure reductions as the major money saver, and the latter two initiatives requiring significant portion of the funding.

How do the service secretaries determine or justify the importance and budgetary backing of each of the various programs? In 2009, Navy Secretary Ray Maybus announced the five goals and his vision for the Navy's energy strategy.

The SECNAV's energy goals as stated in his speech:

> First: we are going to change the way the Navy and Marine Corps awards contracts . . . Second: The Navy will demonstrate in local operations by 2012 a Green Strike Group composed of nuclear vessels and ships powered by biofuel. And by 2016, we will sail that Strike Group as a Great Green Fleet composed of nuclear ships, surface combatants equipped with hybrid electric alternative power systems running biofuel, and aircraft flying only biofuels—and we will deploy

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[112] Ibid.

[113] Secretary of Defense, *Quadrennial Defense Review*, 2014, 1.

[114] Ibid.

[115] Ibid.

> it.[116] Third: the Department of the Navy will by 2015 reduce petroleum use in our 50,000 strong commercial fleet in half—by 50 percent. We'll do this by replacing our current fleet, as they go out of service, with a new composite fleet of flex fuel vehicles, hybrid electric vehicles, and neighborhood electric vehicles. Moving to biofuels and electric vehicles will benefit the local communities where our bases are located and will spur adoption of similar vehicles in those neighborhoods. Fourth: the Department of the Navy will by 2020 produce at least half of our shore-based energy requirements on our installations from alternative sources . . . Lastly: By 2020, half of our total energy consumption for ships, aircraft, tanks, vehicles, and shore installations will come from alternative sources.[117]

SECNAV Maybus underscored the savings in fuel costs and energy security as a driver for his ambitious initiatives. However, there are many critics of his plan.

Rep. Randy Forbes (R-VA) obviously concerned about his state's Navy shipyard, questioned SECNAV Maybus during a February 2012 hearing.[118]

> I understand that alternative fuels may help our guys in the field, but wouldn't you agree that the thing they'd be more concerned about is having more ships, more planes, more prepositioned stocks? Shouldn't we refocus our priorities and make those things our priorities instead of advancing a biofuels market? You're not the secretary of energy. You're the secretary of the Navy![119]

Also that year, in an effort to justify the importance of the Navy's energy initiatives, SECNAV claimed that due to, "political unrest in oil producing regions, the price per barrel of oil is $38 more than was budgeted increasing the Navy's fuel bill by over $1

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[116] Ray Mabus, Secretary of the Navy, "Remarks at the Naval Energy Forum" (Hilton McLean Tysons Corner, McLean, VA, 14 October 2009), accessed 2 May 2015, http://www.navy.mil/navydata/people/secnav/Mabus/Speech/SECNAV%20Energy%20Forum%2014%20Oct%2009%20rel.pdf.

[117] Mabus, Remarks at the Naval Energy Forum.

[118] Eli Clifton, "House Republicans Work to Scuttle Navy's 'Great Green Fleet'," Think Progress, 15 May 2012, accessed 2 May 2015, http://thinkprogress.org/security/2012/05/15/484239/house-republicans-scuttle-navy-great-green-fleet/.

[119] Shactman.

billion. These price spikes must be paid for out of our operations funds. That means that our Sailors and Marines are forced to steam less, fly less, and train less."[120]

Throughout the 2014 QDR, budgets, costs savings, and sequestration risks were mentioned as often as the real world global threats that face the nation. Recently, Army Chief of Staff General Ray Odierno stated to lawmakers the effects of sequestration that, "Today, just 33 percent of our brigades are ready, when our sustained readiness rate should be closer to 70 percent."[121] If the military must reduce overhead and streamline their budgets, certainly costly biofuels development by individual DOD services is one of many military programs that should be carefully scrutinized and properly prioritized.

This research clearly illustrates that the DOD lacks an efficient, effective program for development of alternative fuels due to the U.S. political process, intergovernmental bureaucracy, and the DOD budgeting process. Each individual service secretary has implemented service specific energy initiatives that intend to comply with vaguely written policies and guidance. The ever-changing political climate of the current administration, the numerous layers of governmental bureaucracy of the various agencies and departments coupled with the many confusing—often vague policies and directives, as well as serious fiscal competition for resources amongst these institutions, creates a situation that is less than ideal for the efficient R&D of alternative fuels by the DOD and our federal government.

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[120] Mabus, Remarks at the Naval Energy Forum.

[121] David Vergun, "Odierno: Brigade Readiness Half What It Should Be," *Fort Leavenworth Lamp*, 19 March 2015, A3.

CHAPTER 5

CONCLUSIONS

> We must transform the way that we use energy—diversifying supplies, investing in innovation, and deploying clean energy technologies. By doing so, we will enhance energy security.
>
> — President Barack Obama, *National Security Strategy*

This study looked at numerous policies that outline the U.S. government and the DOD strategy for energy security. These directives describe and direct the many agencies and military departments to develop programs to support these policies. The political climate under which these policies are created and the use or misuse of terminology, and the description of goals and there accomplishment, as well as the roles and responsibilities of each, can be misleading. Several studies that were mandated by the DOD were looked at that clearly showed that the DOD lacks an efficient, effective program for development of alternative fuels due to: (1) the U.S. political process; (2) intergovernmental bureaucracy; and (3) the DOD budgeting process.

The DOD is an incredibly complex department of the U.S. government and each of the services that make up the DOD have different service cultures. The DOD needs clear guidance from the SECDEF on each service's role in the development of alternative fuels. The SECDEF should ensure that the DOD policy is nested with the overall energy strategy of the United States. Much of the confusion stems from the non-directive style in which these strategy documents are written. All have broad, overarching goals that tend to directly oppose each other and tend to confuse the nation's priorities. The 2014 QDR describes numerous goals for for the defense of the nation, yet is frought with warnings of budgetary gloom. For instance, SECDEF Hagel described the future course the

nation's military must take, he claimed, "We will prioritize combat power by reducing unnecessary overhead and streamlining enterprise."[122] Yet, he goes on to say that, "we are in a period of fiscal austerity and must maintain the world's finest fighting forces."[123] The broad goal is to reduce force structure which saves money, then spend on modernizing the forces while simultaneously investing to keep the technological edge over the nation's adversaries.[124] The SECDEF must work closely with the DOE to prioritize and provide oversight to these projects and find more efficient ways of developing technologies during times of fiscal shortfalls.

The political climate of each administration causes shifts in priorities of policies and causes inefficiencies as demonstrated by the 2010 QDR, which was written during a period of concerns for the complex security environment.[125] The costs of fighting two wars was starting to wear on the nation. Rising fuel costs had taxpayers and politicians looking for answers.

"In FY2000, fuel costs represented 1.2 percent of the total DOD spending, but by FY2008 fuel costs had risen to 3.0 percent. Over the same time, total defense spending had more than doubled, but fuel costs increased nearly 500 percent."[126] This was followed by the 2014 QDR, written during the harsh realities of the economy and an

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[122] Secretary of Defense, *Quadrennial Defense Review*, 2014, 1.

[123] Ibid.

[124] Ibid.

[125] Secretary of Defense, *Quadrennial Defense Review*, 2010, 5.

[126] Andrews et al., 2.

unclear fiscal environment.[127] Many of these policies discuss or use references to energy independence or self-sufficiency. One report found:

> use of these terms creates unrealistic expectations at home, distracting from genuine policy issues. It feeds feelings of insecurity abroad, causing other countries to speculate that the United States could retreat behind its borders. The United States should instead emphasize that energy markets are global and energy security is shared.[128]

A holistic look at this nation's energy needs, as well as the capabilities for production and growth of the alternative fuels industry would portray a much more complex system that is tied to the global market.[129] The U.S. energy strategy is complex and the DOD and individual department strategies need to be nested with the overall strategy.

The NDAA of 2009 outlined the requirement for the SECDEF to call for a research study of alternate approaches to the reduction of greenhouse gasses, examine mobile in-theater tactical synthetic fuel processes, and a review of the individual service department's progress in meeting the goals of the energy initiatives of R&D as well as testing and certification of alternative fuels. This study, sponsored by the Defense Logistics Agency Energy and conducted by the RAND National Defense Research Institute had numerous findings and recommendations to the SECDEF and the congressional defense committees. The research and findings by the RAND study of

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[127] Secretary of Defense, *Quadrennial Defense Review*, 2014, IV.

[128] International Security Advisory Board, *Energy Geopolitics: Challenges and Opportunities*, A-1.

[129] Ibid.

2011, titled *Alternative Fuels for Military Applications* describes the nuances of each of the individual services programs and goals for energy security.[130]

The NDAA tasked the SECDEF to study of fuel costs and required the DOD to "review of the goals and progress of the military departments in the research, testing, and certification of alternative fuels."[131] Yet, the SECDEF has not passed any guidance to the individual services mandating the inclusion of tactical systems in the alternative fuel programs. Meanwhile, each service has included tactical use of alternative fuels in their individual service strategy. Currently, there is no legislation or executive orders for DOD to utilize alternative fuels in tactical vehicles.[132] Furthermore, the study found that individual strategies of each service are vastly different in respect to alternative fuels.[133]

The Air Force strategy identified goals of increasing fuel supplies and decreasing greenhouse gas emissions, but tied costs directly into the equation.[134] "By 2016, be prepared to cost competitively acquire 50 percent of the Air Force's domestic aviation fuel requirement via an alternative fuel blend in which the alternative component is derived from domestic sources produced in a manner that is greener than fuels produced from conventional petroleum."[135] The Air Force used cost as a factor and chose to use 50 percent as the service goal (assumedly to utilize a certified 50/50 blend), but lacked direct

[130] Bartis and Van Bibber, 67.

[131] Ibid., iii.

[132] Ibid., ix.

[133] Ibid., 67.

[134] Ibid., 68.

[135] Ibid.

goals and guidelines from Office of the Secretary of Defense. When confronted with an obvious lack of clear guidance, the Secretary of the Air Force was forced to create policy directives that describe just that condition. The Air Force directive states: "When specific DOD direction or guidance does not exist for any new federal energy policies, the Department-level energy governance structure, or its designee, will provide guidance for the Air Force."[136]

As discussed earlier in chapter 4, SECNAV Ray Mabus endorsed a plan to deploy a "Green Strike Group" in 2012 and by 2016 a "Great Green Fleet" that is "composed of nuclear vessels and ships powered by biofuels."[137] This strategy contained five separate goals, but none of these goals was tied to costs associated with production.[138] "It's all about our energy security and moving toward complete energy independence. Our military and our country rely too much on fossil fuel. That dependency degrades our national security; it also harms the environment and has a negative effect on our economy."[139]

As demonstrated in the above quote from SECNAV Maybus, each service secretary has different goals and visions in respect to alternative fuels and energy

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[136] Secretary of the Air Force, Air Force Policy Directive 90-17, *Special Management, Energy Management*, 29 November 2011, accessed 18 November 2014, http://static.e-publishing.af.mil/production/1/saf_ie/publication/afpd90-17/afpd90-17.pdf, 3.

[137] Paula Paige, "SECNAV Outlines Five 'Ambitious' Energy Goals," U.S. Navy, 16 October 2009, accessed 18 November 2014, http://www.navy.mil/submit/display.asp?story_id=49044.

[138] Bartis and Van Bibber, 67.

[139] Mabus, Remarks at the Naval Energy Forum.

strategy. Each of the military service's individual civilian leaders have issued guidance to their service level chiefs when clear guidance was lacking or only vague guidance was received from the SECDEF or Congress. The RAND study *Alternative Fuels for Military Applications* concluded that each service has its own set of goals and that none of them are working together. The study also found that DOD's premier agencies tasked and designed to lead R & D for the DOD were not working efficiently. Although DARPA and Defense Logistics Agency-Energy had established programs to produce and develop alternate fuels, the study found the DOD lacked unity of effort with the overall defense energy security strategy.[140]

A review of some of the major relevant findings from the RAND study:

1. The study agrees with the overall premise that developing a competitive alternative fuel industry in the United States offers important benefits to the nation.

2. The study clearly stated that there is no direct benefit to the Department of Defense or the services from using alternative fuels rather than petroleum-derived fuels.

3. DOD research, alternative fuel testing, and promotion of early commercial production will benefit the nation as a whole more so than the DOD or the services.

4. DOD's technology-development efforts overemphasize early demonstration and underestimate the difficulty of developing alternative fuel technologies that offer acceptable economic and environmental performance.

5. This finding highlights that most of the DOD research projects are conducted independently, and focus on a single engineering concept.[141]

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[140] Bartis and Van Bibber, x.

[141] Ibid., 81, 83, 84.

The study says an alternative fuels industry is good for the United States, but the DOD does not directly benefit. The study goes on to say that DOD should continue to test and certify biofuels. The roles of the DOD and the DOE need to be clarified. If the DOD continues to support the development of alternative fuels, the services should consolidate.[142] Following the release of this report, the Navy directly rejected the finding that biofuels did not benefit the military.[143] Clearly, the DOD services lack unity of effort in regards to the development, production and importance of biofuels.

The DOE should help tie all the efforts together. The DOE was created because of the energy crisis of the 1970s and the DOE and its labratories are charged with discovering and developing technological advancements and then helping those technologies reach the market place.[144] Many laws and policies have been passed that placed (or misplaced) the responsibility (all with good intentions) for development of synthetic fuels and the use of natural resources into the DOD mission. As a 2009 Congressional Research Report stated: "An effective energy strategy for the United States must be informed by history and exploit rather than defy the laws of nature in order to increase global stability and US security."[145]

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[142] Bartis and Van Bibber, 84-86.

[143] Captain T. A. Keifer, "Twenty-First Century Snake Oil: Why the United States Should Reject Biofuels as Part of a Rational National Security Energy Strategy" (Paper No. 4, Waterloo Institute for Complexity and Innovation, University of Waterloo, Waterloo, Ontario, Canada, January 2013), 3.

[144] U.S. Department of Energy, *Strategic Plan,* 9.

[145] Keifer, 29.

For example, the Nazi Germans used proven science and placed the responsibility for development of its synthetic fuels program under various non-military Reich offices such as the Ministry of Economics and Interior, which by mandate had jurisdiction, the personnel, experience, and a budget to help govern the synthetic fuels industry. These non-military offices clearly understood the oil and coal industry and maintained a special relationship with Germany's domestic oil industry to accomplish the mission of producing domestic synthetic fuels. The Germans developed the technology to produce liquid petroleum fuels from coal, and created the first successful synthetic fuels industry which peaked production in 1944 at 124,000 barrels per day.[146] This wartime high mark was achieved with extremely high production costs. These included forced labor and the many subsidies and incentives the Nazis government used to offset the high costs. Following the war, the Allies shutdown the high-cost Nazi-controlled synthetic fuels program.[147] In the United States, subsidies in the biofuel market hide the true costs of R&D and promote industry by falsely influencing the laws of supply and demand.

Following the release of the 2010 QDR, the SECDEF seemed to be moving in the right direction when he created the ASD(OEFF).[148] The mission of the ASD(OEPP) is to provide oversight and guidance in the promotion of military energy security.[149] The DOD and ASD(OEFF) produced a document called *Energy for the Warfighter: Operational*

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[146] Stranges, 8.

[147] Ibid., 1.

[148] Assistant Secretary of Defense for Operational Energy Plans and Programs, accessed 5 May 2015, http://energy.defense.gov/.

[149] Assistant Secretary of Defense for Operational Energy, Plans and Programs, *Energy for the Warfighter: Operational Energy Strategy*, intro.

Energy Strategy.[150] This document states that the DOD needs to reduce its military energy costs so that the it can better resource other warfighting priorities.[151] Yet the strategy claims that DOD "currently procures alternative fuels at a premium for testing purposes, the Department will acquire such fuels for military operations at prices that are competitive with the market price for conventional fuels."[152]

Even with the newly formed ASD(OEPP) providing guidance, individual services continued to develop their own initiatives. The U.S. Navy used the fear of rising fuel costs with statistics like, "a one dollar rise in the cost of a barrel of oil increases annual fuel costs by $31 million" to justify the Navy energy strategy.[153] However, "the cheapest price the Navy has paid for any biofuel to date is $1,080.66 per barrel ($25.73 per gallon)."[154]

The processes involved in the R&D of biofuels are extremely complicated and can be quite confusing. In a report written by Navy Captain T. A. (Ike) Kiefer, he explains:

> Liquid biofuel prices are already as volatile as oil prices and track up and down with the international oil market. The recent drought in the US Midwest caused a corn price spike that already has forced the shutdown of many ethanol refineries and is jeopardizing fuel-blending mandates. Deriving fuel from farming does not liberate it from petroleum dependence or oil market price volatility, but rather increases price volatility by adding an additional linkage to global agricultural

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[150] Assistant Secretary of Defense for Operational Energy, Plans and Programs, *Energy for the Warfighter: Operational Energy Strategy*, intro.

[151] Ibid., 8.

[152] Ibid.

[153] Kiefer, 27.

[154] Ibid.

> commodities markets. Energy security is reduced by choosing a primary energy source that has no proved reserves, but rather is created from scratch annually and is subject to floods, freezes, droughts, and blight.[155]

The 2011 DOD study labeled *Opportunities for DoD Use of Alternative Fuels* had the following major findings:[156]

Pros: The study indicated that the use of renewable fuels by the DOD certainly supports the U.S. energy strategy and that the services' gain some military utility to the blending to include "lower freeze points, cleaner combustion and potential for designer fuels" [157]

Cons: The study found that although the intent is for markets to develop over the next 10 years or so, the current high prices and of these fuels will result in an estimated "$2.2 billion in additional fuel costs by 2020,"[158] and that "Drop-in renewable jet fuel production is not likely to meet the Services' goal-based demand for more than 570 million gallons in 2020."[159]

In 2011, the White House released *The Blueprint for a Secure Energy Future*.[160] This document had three tenants; develop and secure America's energy supplies, provide consumers choices to reduce costs and save energy, and innovate a path to a clean energy

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[155] Kiefer, 27.

[156] Department of Defense, *Opportunities for DoD Use of Alternative Fuels*, iii.

[157] Ibid.

[158] Ibid.

[159] Ibid.

[160] U.S. President, *Blueprint for a Secure Energy Future*, 2.

future.[161] Although titled as a Blueprint, this document did not provide specific guidance to the DOD. It was written more as a vision with broad goals.

One year later, the Deputy Assistant to the President Energy and Climate Change, Secretary of DOE, Secretary Department of Transportation, Secretary Department of Interior, Administrator Environmental Protection Agency, Secretary Department of Agriculture, and Secretary Department of Housing and Urban Development released *The Blue Print for a Secure Energy Future: Progress Report*.[162] Although the report signatories covered many of the major departments of the federal government, the DOD and the DOS were not represented. Following the administration's vision, during that same year, the DOS created the Bureau of Energy Resources, which identified energy as a central role for diplomatic priorities.[163] This is one more layer of government that has been created and tasked to play a role in our energy security.

The 2014 QDR executive summary states that, "FY2015 funding levels requested by the President will allow the military to protect and advance US interests and execute the updated diverse strategy—but with increased levels of risk for some missions."[164] The impacts of climate change and energy and water security are mentioned in the 2014 QDR, yet under the section titled U.S. Strengths and Opportunities the document touts that "Shale gas discoveries and new technologies allowing access to hydrocarbon

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[161] U.S. President, *Blueprint for a Secure Energy Future*, 2.

[162] Zichal et al., 1.

[163] International Security Advisory Board, *Energy Geopolitics: Challenges and Opportunities*, A-2.

[164] Secretary of Defense, *Quadrennial Defense Review*, 2014, iv.

deposits appear likely to enable the United State to be a net energy exporter in the coming decades."[165] The document does stress in one line that the, "Department has invested in energy efficiency, new technologies, and renewable energy sources to make us a stronger and more effective fighting force."[166] The QDR stresses that "the pace of technological and scientific innovation in the private sector, particularly in energy markets, has the potential not only to revolutionize entire industries but also to enable new ways of providing for U.S. security in the future."[167]

Furthermore, the Chairman of the Joint Chiefs of Staff, General Martin E. Dempsey states in the 2014 QDR, "With our 'ends' fixed and our 'means' declining, it is therefore imperative that we innovate within the 'ways we defend the Nation."[168] Certainly oversight, strict guidance, and specific taskings are needed for each of the individual services to help provide unity of effort, maintain operational combat power, and prioritize budgets in the fiscally constrained environment the nation's military faces.

In a 2014 report titled *Energy Geopolitics: Challenges and Opportunities*, the International Security Advisory Board (for the DOS) recommended that DOS should "take the lead, along with Energy and Commerce Departments, in engaging private sector (especially the energy sector) in crafting viable national energy strategies for the United

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[165] Secretary of Defense, *Quadrennial Defense Review*, 2014, 9.

[166] Ibid., 25.

[167] Ibid., 6.

[168] Ibid., 59.

States."[169] The report detailed that DOS does not leverage the US's ability to influence other countries in respect to energy supply and production. It also highlighted that the nation's energy strategy is complex and made up of numerous policies, directives, statutes and executive orders. This makes for it difficult for the nation to produce an integrated energy strategy.[170]

What is needed? A coordination center similar to a joint interagency coordination group[171] should be established to facilitate unity of effort amongst all stakeholders. This proven sort of entity will help ensure interorganizational coordination, define and achieve common goals and strategies, and clarify end states and national strategic objectives.[172] By doing so, the DOE, the DOS and its Bureau of Energy Resources would work closely with the SECDEF and the ASD(OEPP), DARPA and Defense Logistics Agency-Energy, as well as the Department of Transportation, the Department of Agriculture, Department of Commerce and various commercial industry and academic instutions to ensure each organizations's visions and goals are nested with the nation's overall energy strategy. By using a whole-of-government approach,[173] this entity would provide oversight and guidance to each entity and streamline efforts for unified action and a more efficient execution of the national energy strategy.

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[169] International Security Advisory Board, *Energy Geopolitics: Challenges and Opportunities*, A-2.

[170] Ibid.

[171] Joint Chiefs of Staff, Joint Publication 3-08, ix.

[172] Ibid.

[173] Ibid., xiii.

The cyclical nature of the U.S. political process is driven by crisis and instability. Layers of governmental bureaucracy and interagency politics disrupt efficient execution of strategy. Economic realities drive the budgets of the military services. This study showed that the DOD lacks an efficient, effective program for development of alternative fuels due to: (1) the U.S. political process; (2) intergovernmental bureaucracy; and (3) the DOD budgeting process.

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